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## Dentoalveolar effects of lip bumper: a systematic review

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# Dentoalveolar effects of lip bumper: a systematic review

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## Abstract

**Background:** The lip bumper is a functional device capable of neutralize the centripetal force produced by lips and cheeks, releasing expansive action produced by the tongue. Itâ€™s indicated to recover space at the lower arch, keep the leeway-space, treat malocclusions related to thumb sucking and bottom lip interposition and to reinforce the rear anchorage. Aim of this review is to investigate dentoalveolar changes produced by lip bumper, his long term stability and the effects of a resin shield. **Methods:** A systematic review was performed on principal medical databases. **Results:** Dentoalveolar effects caused by lip bumper are transverse expansion, elongation of the arch, incisive vestibularization, molar distalization, intrusion, derotation, lingualization and uprighting, maintenance/increase of lee-way space. The effects are stable over the time. The shield lip bumper produces 25% higher resting forces on molars than the wire lip bumper. **Conclusions:** Lip bumper appliance causes principally transverse expansion, elongation of the arch, incisive vestibularization and molar distalization.Â

## Introduction

Teeth are in a position of muscular equilibrium, contained in a neutral corridor between the perioral muscle force and the strength of the tongue.<sup>1-2</sup>

The lip bumper is a functional device capable of neutralize the centripetal force produced by lips and cheeks, releasing expansive action produced by the tongue.<sup>3-11</sup>

Itâ€™s a functional appliance, fixed or removable, that passes between teeth of lower arch and lip modifying the muscle balance which determines the position of the incisors.<sup>12</sup>

FrÃ¶nkel demonstrated the influence of soft parts on the bone structure of the jaws.

The use of simple shields between cheeks and dentoalveolar processes neutralizes the action of the cheeks themselves and allows a natural transversal expansion of the jaw. Some lip bumper appliances

have a resin shield in addition to the wire.

Indications of lip bumper are:

- recovery of space at the lower arch (mild - moderate crowding);
- keeping the leeway-space (lee-way space is the space where the first molars slide following the exchange of the deciduous second molars<sup>13</sup>);
- malocclusions related to thumb sucking and bottom lip interposition;
- Rear anchorage reinforcement.

The time to use lip bumper is that of late mixed dentition but in case of serious crowding, bad habits or morpho-functional imbalances itâ€™s appropriate to anticipate the times.<sup>14</sup>

Most lip bumpers are made of stainless steel wire (usually 0.045 inch) coated with plastic or acrylic<sup>5</sup>. The lip bumper is positioned in front of and away from the lower anterior dentition; it inserts into buccal tubes cemented to the first or second permanent molars. Usually there are adjustment loops in the lateral arms.

Regarding transversal position, the lip bumper is normally 2 mm from the canines and 3-4 mm from the lower premolar; variations in this distance lead to greater or lesser control of the vestibularization of the side branches of the arch.

Regarding sagittal position, itâ€™s normally 2 mm from the margin of the incisors; variations in this distance lead to a greater or lesser control of their vestibularization.

The lip bumper can be positioned at 3 different heights of the crown of dental elements:

- Incisal third: to correct the molar mesial inclination.
- Medium third: alters the lips / tongue balance in favor of the latter.

Third gingival: in this configuration does not alter the balance lips / tongue; it is useful to maintain the position of the incisors.

Aim of this review is to investigate dentoalveolar changes produced by lip bumper, his long term stability and the effects of a resin shield.

## Methods

This systematic review was carried out on principal

medical databases: Pubmed (Medline), Scopus. Used keywords were: "lip bumper", "dentoalveolar changes", "lee-way space maintenance". After a careful analysis, 23 articles were selected.

## Review

Dentoalveolar effects caused by lip bumper are transverse expansion, elongation of the arch, incisive vestibularization, molar distalization, intrusion, derotation, lingualization and uprighting, maintenance/increase of lee-way space.<sup>3-13, 15,17</sup>

Regarding lower transverse expansion, studies documented that the biggest expansion occurs between first and second premolars (change of 4-4 distance after treatment varied in studies from 2.1 to 5.0 mm and change of 5-5 distance after treatment varied from 1.6 to 3.6 mm).<sup>4-8,13,15-17</sup>

The use of lip bumper in mixed dentition allows an expansion of the arch with a translatory dental movement.

^ The expansion of the arch that can be obtained with the lip bumper is greater than that due to growth.

Lip bumper therapy creates a greater increase in mandible dimensions observed at baseline than control subjects and patients treated with multibrackets equipment.<sup>18</sup>

About 50% of the total expansion achieved occurred within about the first 100 days.<sup>19</sup> Forty percent of the total amount of expansion occurred during the next 200 days, with only about 10% of the total expansion occurring after the first 300 days.<sup>19</sup>

With the use of the lip bumper, the average space recovery is of 6mm.<sup>3</sup>

The increase in arc length varies from 2.7mm to 7.4mm, after lip bumper therapy.<sup>5</sup>

A long-term study showed that results on mandibular arch dimensions are stable over the time (the average time of follow up after the end of treatment was 7.9 years).<sup>17</sup>

These data were confirmed by Solomon in another long-term study.<sup>20</sup>

Cetlin considers this expansion stable because it is not mechanistic, but of natural type resulting from a rebalancing of the perioral musculature.<sup>4</sup>

Regarding molar distalization, Davidovitch showed in his study a change in molar angulation of 3.4^{\circ}, while O'Connell found a change of 4.7^{\circ}.

Analyzing molar vestibularization, Moin, Osborn,

Davidovitch and O'Connell found in their studies a change in central incisor axial angulation of 1.2^{\circ}, 2.9^{\circ}, 3.2^{\circ}, 4.3^{\circ}.<sup>7-8,10,16</sup>

The lip bumper is able to increase lee-way space of about 1.7 mm for each side.<sup>3-13</sup>

Gianelly said that 84% of patients treated with the correct management of the space in mixed dentition don't have subsequently need for orthodontic treatment with extraction.<sup>21</sup>

Regarding bottom lip interposition, the lip bumper avoids the interposition of the lower lip, allows the vestibularization of lower incisors, allows the lingualization of upper incisors, reduces overjet.<sup>22</sup>

The shield lip bumper produces 25% higher resting forces on molars than the wire lip bumper.<sup>23</sup>

At the same time, lip bumper with resin shield causes greater distal tipping of the molars.<sup>5</sup>

## Conclusions

Lip bumper appliance causes transverse expansion, elongation of the arch, incisive vestibularization, molar distalization, intrusion, derotation, lingualization and uprighting. These changes are stable over the time and within a year of treatment the effects of mandibular expansion are terminated.

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